TOOTHBRUSH CONTAINER WITH TWIST VENT-CAPS AND INTEGRATED DENTAL FLOSS DISPENSER

BACKGROUND OF THE INVENTION

It has been recognized that a dentifrice dispensing toothbrush provides portability and convenience for brushing teeth while away from home, in travel, in workplace or for carry-on in purse for brushing at any time any where. In these uses, a brush cover or a toothbrush container is needed for protecting the bristles and preventing the drying of the toothpaste in the spout opening of the brush head. A conventional toothbrush container having venting holes cannot prevent drying of toothpaste in the spout opening of the brush head. The use of a sealing rod inserted into the spout opening exposes the spout area to the open air environment that allows for slow hardening of the toothpaste. Therefore, it is desirable to have a toothbrush container that provides features for selectively enabling air circulation when the toothbrush is in active use and sealing the toothbrush in an enclosed air environment when placed in storage. Moreover, it is also desirable to have a combination toothbrush container that has integrated dental floss dispenser for providing additional portability and convenience of brushing and flossing while away from home.

(1) Field of the Invention

The present invention relates to toothbrush containers.

(2) Prior Art

US Patent No. 6497236 by Yates et al describes a cup-shaped toothbrush container having a cover with multiple circular holes for holding toothbrushes and a housing supporting a dental floss dispenser. The cover holder is for venting brush heads. It does not provide a mechanism for enclosing the brush head of a dentifrice dispensing toothbrush for preventing

drying of toothpaste. The attached dental floss dispenser utilizes a fixed single-blade cutter assembly. The single-blade cutter requires three-steps operation in completing cutting of floss strand; the first step being placing floss strand in the cutter assembly, the second being manual pulling of floss strand against the single blade and cutting, and the third being enclosing the lid of the cutter assembly. The second step of manual pulling the dental floss for cutting presents great difficulty for persons lack of finger dexterity.

For sealing the spout of toothpaste tube, US Patent No. 5979706 by Grussmark provides a combination dental floss dispenser and a stand-up toothpaste container having a flip cap or a screw-on cap. The dental floss dispenser can be attached to either a flip-open cap or to a screw-on cap. For a flip cap type, the flip mechanism is used to selectively open and close the dispensing nozzle. For a screw-on type, the cap screws onto the nozzle to close the nozzle and prevent toothpaste dispensing. However, the described mechanisms are not applicable for sealing the spout of a dentifrice dispensing toothbrush. For the flip or a hinged type, the angular motion of the sealing element cannot provide full sealing contact with the straight spout wall. As for the screw type, the threaded sealing element requires extra clearance space in the spout area that reduces the effective bristle space for brushing. Its dental floss cutter assembly uses a single blade that requires aforementioned three-steps operation for cutting.

US 6,129,090 by Pillar et al. discloses a combination toothbrush cap assembly having an upper portion for housing a dental floss dispenser and a lower portion for enclosing brush head while allowing the brush handle portion exposed for handling. The disclosed structure does not provide applicable sealing function for a dentifrice dispensing toothbrush. Also, its long and narrow cavity for storing the brush head is not easily accessible for cleaning. Similarly, the dental floss cutter uses a single blade that requires three-steps operation.

For sealing the spout opening in the brush head used in a dentifrice dispensing toothbrush, the US Patent No. 6599048 by Kuo uses a plug having a sealing rod shielded by an annular wall for engaging the spout wall of dispensing opening in the brush head. The outer annular wall for sealing takes extra space in the spout area that reduces effective bristle area for brushing. Besides, any defective sealing due to manufacturing tolerance at the spout area can significantly deplete the moisture from inside the spout area that causes drying and hardening of the toothpaste beneath the spout opening because of the exposure of the spout area to the open ambient air environment.

In view of the above prior art, there is lack of means for providing an enclosure for blocking air exchange in the vicinity of the spout area of a dentifrice dispensing toothbrush for preventing drying of toothpaste when in storage as well as selectively venting and drying the bristles of the toothbrush when in active regular use. Furthermore, the manual cutting with forceful pulling of floss strand is preferably replaced by an automatic means which cuts the floss strand by enclosing a cutter lid, a two-steps operation rather than the three-steps operation for a single-blade cutter.

Therefore, it is an objective of present invention to provide a toothbrush container for enclosing and sealing a dentifrice dispensing toothbrush for preventing drying of toothpaste in the spout when in storage as well as selectively venting the bristles when in active regular use. It is another objective of the present invention to have a combination toothbrush container integrated with a dental floss dispenser in one portable unit for the portability and convenience of brushing and flossing teeth. It is a further objective of the combination toothbrush container of the present invention having a dental floss dispenser with an automatic cutter for severing floss strand with less number of steps.

SUMMARY OF THE INVENTION

For carry-on and storage, a toothbrush container is provided for selectively venting and sealing a dentifrice dispensing toothbrush for drying bristles and for preventing hardening of toothpaste in the spout opening in the brush head. The toothbrush container of the present invention consists of a hollow vent-tubing having vent holes near the top and the bottom end, as well as a top vent-cap and a bottom vent-cap. Both vent-caps have corresponding vent holes and can be twisted to align their vent holes with that of the vent-tubing for air circulation or for covering the vent holes for sealing the air paths for preventing drying of the toothpaste. In addition to having vent holes, the top vent-cap of a combination toothbrush container of the present invention is attached with a dental floss dispenser which is equipped with a scissors-like two-blade cutter assembly for automatically severing a dental floss strand when a hinged cutter lid having one blade is enclosing on a support wall having a mating blade. For enhancing the sealing function, a vent-cap having concentric dual walls with vent holes on each wall is used for doubling the length of sealing path for preventing drying of toothpaste.

In summary, key advantages of the toothbrush container of the present invention are selective venting and sealing functions of vent-caps for air circulation of bristles and for preventing drying of toothpaste , as well as the automatic cutting of dental floss by the action of closing the cutter lid.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is an exploded view of a toothbrush container of the present invention including a cylindrical vent-tubing, a top vent-cap and a bottom vent-cap with each vent-cap having two opposing vent holes aligned with vent holes in the vent-tubing.

Fig. 2 is a perspective view of the toothbrush container of Fig. 1 enclosing a dentifrice dispensing toothbrush with top vent-cap and bottom vent-cap mounted on the vent-tubing with all vent holes aligned in open positions.

Fig. 3 is a perspective view of the toothbrush container of Fig. 2 with top vent-cap and bottom vent-cap covering vent holes of the vent-tubing.

Fig. 4 is a perspective view of a dual-wall vent-cap of a toothbrush container illustrating concentric first annular wall and second annular wall with centers of vent holes aligned on the same symmetry plane.

Fig. 5 is a cross-sectional view of a toothbrush container with the mounting of top and bottom dual-wall vent-caps on a vent-tubing with all vent holes aligned in open positions.

Fig. 6 is a cross-sectional view of the toothbrush container of Fig. 5 with each vent-cap covering vent holes of the vent-tubing.

Fig. 7 is a cross-sectional view of a combination toothbrush container with a combination vent-cap having an integrated dental floss dispenser.

Fig. 8 is a perspective view of the combination vent-cap of Fig. 7 with the housing cover partially open and a dental floss strand drawn through an exit opening on the cutter support wall over a first cutter blade.

Fig. 9 is a perspective view of the combination vent-cap of Fig. 8 with the housing cover closed on the cutter support wall and the dental floss strand confined in the exit opening.

Fig. 10 is a cross-sectional view of the combination vent-cap of Fig. 9 illustrating a dental floss strand placed between the first and the second cutter blades.

Fig. 11 is a cross-sectional view of the combination vent-cap of Fig. 9 illustrating the engagement of the first and the second cutter blades in severing the dental floss strand.

Fig. 12 is cross-sectional view of a combination vent-cap of a toothbrush container illustrating a fixed cutter blade assembly having a single blade element.

Fig. 13 is an alternate embodiment of a toothbrush container of the present invention with a vent-tubing having an enclosed bottom end.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

Throughout the following detailed description, the same reference numerals refer to the same elements in all figures.

Referring to FIG. 1, a toothbrush container 1 for storing a dentifrice dispensing toothbrush of the present invention is shown in an exploded view. The toothbrush container 1 includes cylindrical circular hollow vent-tubing 2, top vent-cap 15 and bottom vent-cap 35. The cylindrical circular hollow vent-tubing 2 has annular wall 4 having top opening edge 3 and bottom opening edge 5 both being perpendicular to the longitudinal axis 8 of the vent-tubing 2. At an equal first distance from the top opening edge 3 are located a pair of opposing vent holes 7 and 9 and from the bottom opening edge are located at equal second distance a pair of opposing vent holes 11 and 13 on annular wall 4 with all hole centers being aligned on the same symmetry plane 75, which is in parallel and passing the longitudinal axis 8 of vent-tubing 2. Also shown in Fig. 1, the top vent-cap 15 has first cylindrical circular annular side wall 16, closed wall 17 which is shown as a planar wall, and opening edge 19 which is perpendicular to the longitudinal axis 18 of first annular side wall 16. At the equal first distance from the enclosed planar wall 17 are located a pair of opposing vent holes 21 and 23 on first annular side wall 16. The vent holes 21 and 23 are aligned on the same symmetry plane 20, which is in parallel and passing the longitudinal axis 18 of first annular side wall 16. Similarly, the bottom vent-cap 35 has first cylindrical circular annular side wall 40 with

enclosed wall 37 which is shown as a planar wall, and opening edge 39 which is perpendicular to the longitudinal axis 38 of first annular side wall 40. At the equal second distance from the enclosed planar wall 37 are located a pair of opposing vent holes 41 and 43 on first annular side wall 40. The vent holes 41 and 43 are aligned on the symmetry plane of the first annular side wall 40. Fig. 1 also shows a view that the vent holes of the vent-tubing, and vent holes of the top and bottom vent-caps are all aligned on the same symmetry plane. As a preferred embodiment said first distance and said second distance are the same such that the top and the bottom vent-caps are interchangeable in use.

The functions of the toothbrush container 1 of the present invention are illustrated in Fig. 2 and Fig. 3 with a dentifrice dispensing toothbrush 51 placed inside the toothbrush container 1, which is covered with top and bottom vent-caps 15 and 35. The dentifrice dispensing toothbrush 51 is exemplified by the type described in US 5,909,977 by Kuo. It consists of cartridge handle 53 containing toothpaste and a piston, a pump head having a compressible elastic button 55, a one-way valve, and a brush head 57 having bristles and a spout 61. The toothpaste is dispensed from the cartridge handle to the top of bristles through an internal flow channel extending from the pump head to the spout of the brush head. When the dentifrice dispensing toothbrush is not in regular use, for storage the toothpaste at the spout opening needs to be prevented from drying as hardened toothpaste may cause dispensing problems.

Fig. 2 shows both the top and the bottom vent-caps 15 and 35 being in open position in which symmetry planes 20 and 42 (shown in Fig.1) of the top and the bottom vent-caps 15 and 35 are in plane with the symmetry plane 75 of the vent-tubing 2. Both the top and the bottom vent-caps are fully mounted on the vent-tubing with their planar walls pressed against edges of the top and the bottom opening edges, respectively. As described previously,

because of equal distance the centers of vent holes 21 and 23 of the top vent-cap 15 are matching with the centers of vent holes 7 and 9 of the vent-tubing 2, so are centers of vent holes 41 and 43 of bottom vent-cap 35 matching with the centers of the vent holes 11 and 23 of the vent-tube 2. At this fully vented open position, the brush bristles are exposed to ambient air for drying. The drying of bristles is facilitated through diameter-wide air flow paths across each pair of opposing vent holes at the top and at the bottom vent-caps as well as longitudinal-wide air path between the top and the bottom vent-caps.

For preventing drying of the toothpaste in the spout opening, the vent holes 7, 9 and 11, 13 in the vent-tubing 2 need to be fully closed and sealed. The most effective closing and sealing of these vent holes are illustrated in Fig. 3, in which the symmetry planes 64, 66 of the top and the bottom caps 15, 35, respectively, are at 90 degree to the symmetry plane 60 of the vent-tubing 2, which provides maximum sealing path distance for the vent holes. Here, a sealing path distance is defined as the distance between a vent hole of a vent-cap and a vent hole of the vent-tubing.

In the sealed toothbrush container as described above, the air inside the toothbrush container is isolated from the outside open ambient air. The sealed toothbrush container limits the amount of moisture loss from the spout to the internal air volume. The moisture loss is a result of the evaporation and diffusion process. However, the amount of moisture loss is limited due to the fact that an equilibrium state is reached at which the rate of moisture loss becomes asymptotically slow. Furthermore, any air leakage at the sealing area due to imperfect sealing at the tube wall will be diluted by the much larger volume of internal air, therefore, the equilibrium state is less affected in comparison with the case of sealing at the spout area, such as the case described in US Patent No. 6599048 by Kuo, which is immediately exposed to the open ambient air where no equilibrium state can be reached and

its rate of moisture loss is high at the presence of any defective sealing. In other words, under the same degree of manufacturing imperfection for sealing, the air exchange rate at the sealing area of a vent hole on the vent-tube is much slower than that at the sealing area of the spout opening in the brush head.

For providing snug-fit for selectively sealing the vent holes of a vent-tubing, the top and the bottom vent-caps are made of flexible sealing material. In each vent-cap the inside diameter of the annular side wall being slightly smaller than the outside diameter of the vent-tubing for achieving slidable frictional fit when the vent-caps are mounted on the vent-tubing. For facilitating twisting of the vent-caps for on-off function in sealing the vent holes of vent-tubing 2, grip ribs 25 and 45 (as shown in Fig. 1) are added to the periphery of the annular side walls of the top and the bottom vent-caps 15 and 35, respectively.

Optionally, for preventing drying of toothpaste in the spout of a brush head, a vent-cap of a toothbrush container may include two side walls. Fig. 4 shows a dual-wall vent-cap 85 of present invention for mounting on a vent-tubing for adding extra sealing layer for preventing drying of toothpaste in the spout of a dentifrice dispensing toothbrush in an enclosed air environment. The dual-wall vent-cap 85 has first annular side wall 86, second annular side wall 105 and a closed planar wall 87. Both first and second side walls 86, 105 are cylindrical circular and concentric having the same longitudinal axis, and their edges 89, 90 at the opening end being perpendicular to the longitudinal axis. In this configuration, centers of vent holes 111, 113 on the second annular side wall 105 are aligned with the centers of the vent holes 91, 93 of the first annular side wall 86. Moreover, grip ribs 95 are added to the periphery of first annular side wall of said dual-wall vent-cap for facilitating twisting of the dual-wall vent-cap mounted on a vent-tubing.

Similar to the illustrations in Fig. 2 and Fig. 3 for the single wall vent-caps 15, 35, Fig. 5 and Fig. 6 illustrate top and bottom dual-wall vent-caps 215, 235 at open and closed positions respectively. Fig. 5 is a cross-sectional view of a toothbrush container 200 with the mounting of top and bottom dual-wall vent-caps 215, 235 on a cylindrical vent-tubing 201 with all vent holes aligned in open positions. Fig. 6 is a cross-sectional view of the toothbrush container of Fig. 5 with each vent-cap covering vent holes of the cylindrical vent-tubing. For ensuring sealing contact, the annual gap 115 (indicated in Fig. 4) between first and second annular side walls 86, 105 is sized for snug fit with annular wall 222 of the vent-tubing 201. In this dual-wall configuration, the sealing path length from a vent hole of the first annular side wall to the opposing vent hole of the second annular side wall is twice the corresponding sealing length of a single wall vent-cap.

For the convenience of brushing and dental flossing while away from home, it is desirable to have a dental floss dispenser added on a toothbrush container. FIG. 7 shows a combination toothbrush container 300 having vent tube 301 and combination vent-cap 311 integrated with a dental floss dispenser 346. The combination vent-cap 311 includes an annular side wall 315 with an extended upper wall 314 forming a dental floss housing with housing cover 317 for enclosing dental floss chamber 316 and an cutter lid 331 for enclosing a cutter assembly. The first annular side wall 315 has a pair of opposing vent holes 321, 323 which have the same functions as vent-holes 21, 23 of vent-cap 15 shown in Fig. 2 and Fig. 3 for selectively opening and closing the vent holes 307, 309 of the vent-tubing 301. The dental floss housing of the combination vent-cap 311 includes upper wall 314 which is extended from first annular side wall 315, a partition wall 324 with upwardly directed first split circular annular wall 345, and housing cover 317 with its proximal end having first hinge 319 connected onto the top edge 318 of the upper wall 314. The first split circular annular wall 345 is for

centering dental floss spool 351 placed inside chamber 316 and its inner surface is for engaging with the outer surface of the opposing second split annular wall 349 which protrudes from the inner surface of the housing cover 317. Both first and second split circular annular walls have V-shaped cutout 347 for flexible mating and the second split circular wall 349 has protruded rings on the outer surface for providing interference-fit between the two split annular walls. The upper wall 314, partition wall 324 and housing cover 317 define a chamber 316 within which is disposed a spool 351of dental floss. The chamber 316 is dimensioned with sufficient clearance on all sides to receive and retain a spool of dental floss to allow the spool to rotate freely as a floss strand is withdrawn through an exit opening on the cutter support wall 359.

Extended from the distal end of the housing cover 317 is cutter lid 331 with second hinge 333 that enables the cutter lid 331 to pivot to enclose the cutter support wall 359 when the housing cover 317 is enclosing the dental floss chamber 316. Furthermore, one section of the upper wall 314 is cutter support wall 359 having exit opening 361 for passing through a dental floss strand of the dental floss spool. The cutter support wall 359 has molded-in ribs forming a recess for inserting first cutter blade 355. The second cutter blade 357 is inserted in the recess formed between ribs molded on the inner surface of the cutter lid 331. The positions of the first and the second cutter blades 355, 357 are designed to form a cutting edge for severing a strand of dental floss placed between the two blades when the cutter lid 331 is enclosing on the cutter support wall 359.

Fig. 8 shows a perspective view of the combination vent-cap 311 having dental floss dispenser 346 of Fig. 7 with the housing cover 317 partially open and dental floss strand 353 drawn through the exit opening 361 on a cutter support wall 359 and placed over first cutter blade 355. The closing of housing cover 317 is shown in Fig. 9 in which the periphery rim

(not shown) of housing cover 317 is in friction fit with all sides of the inner surface 352 of the upper wall 314 and the second split wall 349 being inserted onto the first split wall 345 with interference fit as described previously (not shown in Fig. 9). Specifically, at the closing position the insertion tab 363 is engaged in the dental floss exit opening 361 for limiting the opening for confining the strand 353 of the dental floss withdrawn from the spool. The lead strand is shown at a cutting position laid in between the cutting edge of the first and the second cutter blades 355 and 357.

For further illustration, Fig.10 is a cross-sectional view of the combination vent-cap 311 of Fig. 9 illustrating a dental floss strand 353 looped between the first and the second cutter blades 355, 357 for cutting. And Fig. 11 is a cross-sectional view of the combination vent-cap of Fig. 9 illustrating the engagement of the first and the second cutter blades 355, 357 in severing the dental floss strand 353 at the cut edge 373 as the cutter lid 331 is lowered and pressed against the cutter support wall 359. Since the support ribs for the first cutter blade 355 on the cutter support wall 359 and the support ribs for the second cutter blade 357 on cutter lid 317 are all injection molded in one integral piece, their relative positions are precisely controlled in the design and in the injection molding process that the edges of the first and the second cutter blades can be precisely aligned to function as a pair of scissors blades to severe a strand of dental floss placed between the two blades. This scissors-like blades configuration has the advantage of cutting the dental floss strand automatically by enclosing the cutter lid, saving the step of pulling and forcing the floss strand against a cutter blade by fingers, which is required for a conventional fixed cutter assembly having a single blade as described in the following embodiment.

Alternatively, a single blade cutter 480 may be mounted on the cutter support wall 459 for cutting dental floss strand as illustrated in Fig.12. Fig. 12 is cross-sectional view of a

combination vent-cap 411 of a toothbrush container of present invention illustrating a fixed cutter assembly 480 having a single cutout blade element 457 forming a V-shaped bent with mounting base 455 for lodging a strand 453 of dental floss spool 451 for manual severing of the lead strand 471. In this embodiment no cutter blade is mounted on the cutter lid 431. Both the mounting base 455 and the cutout blade 457 are formed from a thin metal sheet by a metal stamping method. The use of such a single-blade cutter requires an user to grab the lead of dental floss strand by fingers and force it against the cutter blade for cutting off the strand.

In the forgoing preferred embodiments as illustrated in Fig. 1, Fig. 5 and Fig. 7, top and bottom vent-caps 15, 35 are used for selectively opening and closing the vent holes 7, 9 and 11, 13 in the vent-tubing 2, respectively. Alternatively, instead of two vent-caps, a single vent-cap may be used. Fig. 13 is an alternate embodiment of a toothbrush container 501 of the present invention with a cylindrical vent-tubing 502 having an enclosed bottom end 505 and a top opening edge 503. The top opening edge is mounted with a combination vent-cap 515 integrated with a dental floss dispenser 546. The features and functions of the vent holes in the vent-tubing and that in the combination vent-cap with dental floss dispenser are the same as that described previously in Fig. 1, Fig. 5 and Fig.7. Optionally, the combination vent-cap 515 in Fig. 13 may be replaced by a dual-wall vent cap 85 of Fig. 4 or a combination vent-cap 411 of Fig. 12.

The invention has been described in detail with reference to preferred embodiments thereof. However, it is understood that variations and modifications can be effected within the spirit and scope of the invention.

I claim:

1. A toothbrush container for enclosing a dentifrice dispensing toothbrush comprising: